

Barrier Grouping 2

**Apparent limitations on amount of
RE power that can be
accommodated by electric utilities.**

INTRODUCTION:

The ability of a utility to accommodate additional power (whether generated from a renewable or a conventional, oil-fired facility) will depend on the utility's need for power, whether the power is firm or as-available, whether the power is dispatchable or intermittent, the reliability of the power, the extent to which the power will be available (and the extent to which it will be available during yearly and daily peak periods), the physical characteristics of the power (and its impact on the stability of the utility system), and other factors.

Barrier 2.a**Minimum load conditions leading to curtailment.****DEFINITION:**

Utility system minimum load conditions (during late evening or early morning periods) can result in curtailment of as-available renewable generation and can affect the economic viability and financeability of renewable projects.

DISCUSSION:

As-available renewable resources are currently paid on the basis of delivered energy, rather than on the basis of available capacity.¹ If these resources are curtailed because of minimum load conditions of the utility system, the payments to renewable resource generators are reduced.

Renewable resources that provide firm capacity may also be affected by minimum load conditions. Given the utilities' minimum load constraints, the utilities may require that the firm renewable facilities be cyclable. At the very least, the ability of the firm renewable facilities to load follow and/or cycle off-line under utility dispatch must be given weight in the determination of avoided capacity costs.

The development of energy storage systems (whether utility-owned or owned by RE developers) would allow energy generated during off-peak hours to be stored and used as a source of on-peak energy. For example, (1) HECO², HELCO and MECO, as part of their Supply-Side Action Plans, agreed to conduct separate studies to examine the potential for pumped storage hydroelectric within their service areas, and (2) HELCO has studied the feasibility and received two bids for the installation of a Battery Energy Storage Plant on the Big Island.

¹ The circumstances under which as-available QF facilities can be curtailed are established by federal and state rules. H.A.R. §6-74-24, based on 18 C.F.R. 304(f). See Re Hawaiian Electric Co., 81 P.U.R. 4th 419 (Haw. PUC 1986), quoting 45 Fed.Reg. 12214, 12227-28 (Feb. 25, 1980) (FERC Commentary).

² DLNR, DBEDT and HECO are nearing the completion of a cooperative study regarding the feasibility of a pumped storage hydroelectric project at two sites on Oahu.

There are also utility DSM programs that encourage customer electricity loads to be shifted from on-peak to off-peak hours, thereby increasing the utility's off-peak loads. These can take the form of rate design programs (such as time-of-use rates³) or "load-shifting" DSM programs targeted at specific end-uses (such as "cool storage" programs aimed at air conditioning loads).⁴

In addition, the development of off-peak loads could be promoted through "valley-filing" DSM programs. For example, Hawaii's shorter driving distances and temperate climate are conducive to the use of electric vehicles. Nighttime charging of electric vehicle batteries could provide off-peak load for electric utilities in the future.

There is consensus that minimum load conditions leading to curtailment can be a barrier to the development of as-available renewable resources.

³ The HECO Utilities currently offer time-of-use service to large general light and/or power loads (Schedule U) and off-peak service to large industrial processing or pumping loads (Rider M), and plan to continue to study the cost-effectiveness of time-of-use rates for residential and other business customers in their IRP processes.

⁴ Customer incentives can be provided by utilities through DSM programs or by government through tax credits. For example, on April 21, 1995 HECO filed an application (Docket No. 95-0092) for approval of a cool storage off-peak contract for St. Francis Medical Center. House Bill 518 pertaining to cool storage air conditioning systems for State buildings and facilities was vetoed by the Governor Cayetano on June 19, 1995, because "it may not generate the energy savings intended, does not add an option that is not already available and commits the State to one industry."

STRATEGIES:

Potential strategies to address off-peak minimum load constraints, include, but are not limited to:

Strategy 2.a.1 Development and implementation of DSM programs that shift load off-peak.

DISCUSSION:

Measures that have the potential to shift existing load off-peak include cool storage and time-of-use rates, and priority peaking rates. DSM measures that have the potential to shift future load off-peak, or "valley filling", include electric vehicle battery storage.

VEHICLE: Utility IRP Processes and DSM Program Design

AGENCY: Utilities

POSITION OF THE PARTIES:

PROPONENTS: heco, ke, d, ki, m, h, n, i, ca, ers, r, z

OPPONENTS:

NO POSITION: p, w, krl

Strategy 2.a.2

Study and possible implementation of energy storage systems such as pumped hydroelectric and battery energy storage plants.

DISCUSSION:

Energy storage systems (i.e., pumped storage hydroelectric and battery energy storage) provide a warehouse of energy that is filled during the low load periods and is emptied during peak load periods. Energy storage systems provide other benefits to the utility such as: (1) the ability to start up quickly to respond rapidly to load fluctuations; (2) spinning reserve (the ability to restore system frequency to at least 58.5 hertz within 3 seconds after a unit tripout); (3) system frequency regulation; and (4) voltage and power factor corrections.

VEHICLE: Utility IRP Processes

AGENCY: Utilities

POSITION OF THE PARTIES:

PROPOSERS: heco, d, m, h, n, ki, r, ca, w, z

OPPOSERS:

NO POSITION: p, i, krl, ke, ers

Barrier 2.b**Intermittency of some renewable energy resources (non-firm power).****DEFINITION:**

Some types of renewable energy are only available at certain times due to the intermittency of wind, sun and water resources.

DISCUSSION:

The intermittency of certain renewable resources (e.g., wind, solar, run-of-the-river hydroelectric) can pose problems regarding integration of power produced from the resource into the utility system grid and/or limit the value of the power (and the price paid for the power). In the case of wind turbines generators, because the wind is sporadic and not dependable, fluctuations of power continuously occur, which can lead to system stability problems (i.e., voltage and frequency fluctuations). The severity of this problem must be determined on a case-by-case basis. There is consensus that this is a barrier.

STRATEGIES:

Potential strategies to address this barrier include, but are not limited to:

Strategy 2.b.1 Reanalyze the amounts of intermittent renewable energy resource power the utility systems can absorb.

DISCUSSION:

The HECO Utilities have stated that they (and/or RE developers) will undertake or update studies to determine the level of intermittent power that each island system can handle.

VEHICLE: Report on Limitations on Penetration of Intermittent Power.

AGENCY: Utilities, RE Developers

POSITION OF THE PARTIES:

PROPONENTS: heco, ke, d, ki, m, h, n, r, ca, z

OPPONENTS:

NO POSITION: p, w, i, krl, ers

Strategy 2.b.2

Study and consider the implementation of energy storage systems.

DISCUSSION:

The HECO Utilities Supply-Side Action Plans address energy storage systems, such as pumped storage hydroelectric and battery electric storage.

VEHICLE: Utility IRP Process and Action Plans.

AGENCY: Utilities, DBEDT, RE Developers

POSITION OF THE PARTIES:

PROPONENTS: heco, d, ki, m, h, n, z, r, ca

OPPONENTS:

NO POSITION: p, w, i, krl, ke, ers

Barrier 2.c.

Need to integrate technology with the grid.

DEFINITION:

Power from renewable energy systems, whether produced by utility-owned facilities or by facilities owned by IPPs, must be integrated into the utility transmission and distribution system.

DISCUSSION:

Intermittent resources that are substantial in size compared to the utility system have posed special integration problems, due to the impact on system stability and the need for spinning reserves as the intermittent power levels fluctuate. Spinning reserves are by definition generating unit capabilities connected to the electrical system that are ready to take load or operating below rated level. For intermittent resources, such as wind generated power that fluctuates in relation to wind speed dynamics, spinning reserves may be necessary to maintain the frequency stability of the utility system. For example, prior MECO and HELCO studies have indicated that the amount of wind generated power their systems could absorb was limited.

There is consensus that this is a barrier.

STRATEGIES:

Potential strategies include, but are not limited to:

Strategy 2.c.1 Reanalyzing the amounts of RE intermittent power the utility systems can absorb.

DISCUSSION:

This strategy is addressed in the discussion of the preceding barrier.

POSITION OF THE PARTIES:

PROPOSERS: heco, ke, d, ki, m, h, n, r, ca, z

OPPOSERS:

NO POSITION: p, w, i, krl, ers

Strategy 2.c.2 Analyzing the potential for niche applications for renewables resources.

DISCUSSION:

There exists the potential for RE power to be used in niche applications off the utility transmission and distribution grid, such as photovoltaics ("PV") for remote location applications to preclude the need for transmission and distribution line extensions.

See also discussion under barrier 9.b.

VEHICLE: HELCO PV applications program to examine PV for remote service.

AGENCY: HELCO

POSITION OF THE PARTIES:

PROPONENTS: heco, ke, d, ki, m, h, n, r, ca, z

OPPONENTS:

NO POSITION: p, w, i, krl, ers

Strategy 2.c.3 Study and consider the implementation of energy storage systems.

DISCUSSION:

This strategy is addressed in the discussion of the preceding barrier.

POSITION OF THE PARTIES:

PROPONENTS: heco, d, ki, m, h, n, r, ca, z

OPPONENTS:

NO POSITION: p, w, i, krl, ke, ers